## Space Weather Forecast

Issued on Saturday, 18 February 2023 at 13:27 Local

**This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: Minor Geomagnetic Storms possible due to CMEs arrival Day 1 (18 Feb) and likely on Day 3 (20 Feb). M-class flares likely, with slight chance X-class flares throughout (R1-R3 Radio Blackouts).**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** Activity has been High with a long period X2.28 (Strong) flare, the strongest of the solar cycle so far, peaking at 17/2016 UTC from a region in the northeast. There are a total of seven sunspot regions on the visible solar disc. The largest has moderate magnetic complexity, and remains inactive. The other regions are generally mature and either stable or declining. A very fast CME associated with the Strong flare was observed and the majority of this material is directed eastwards away from Earth, however there is an Earth directed component and this is forecast to impact Earth on Day 3 (20Feb).

**Solar Wind / Geomagnetic Activity:** Solar winds continue to be indicative of a coronal hole fast wind, slightly elevated, and declining from 490 km/s to 440 km/s. The total Interplanetary Magnetic Field strength remained at Weak levels. The all-important north-south component was also at weakly variable levels. This gave Quiet to Unsettled geomagnetic activity throughout.

**Energetic Particles / Solar Radiation:** The count rate of energetic particles (high energy protons) was at background levels with no solar radiation storms observed.

**Four-Day Space Weather Forecast Summary**

**Solar Activity:** Moderate activity is likely, with a slight chance of reaching High. The main risk for further significant flaring is considered to be from the sunspot region near the northeast limb.

**Solar Wind / Geomagnetic Activity:** A Coronal Mass Ejection (CME) from 15 Feb is now delayed and was forecast to arrive at 17/1800 UTC +/- 12 hours. This carried moderate confidence at best, and may still arrive in the next few hours. A fast CME from 16 Feb, has some potential for a glancing impact later on 18 Feb. The recent CME associated with the Strong flare has been assessed and there is an Earth directed component. This is predicted to impact on Day 3 (20 Feb). Current slightly elevated solar winds are due to a coronal hole fast wind and may be prolonged through Day 1 (18 Feb) by the CME arrival, before easing during Day 2 (19 Feb). Solar winds may then become elevated, possibly Strong for a spell on the 20 Feb, as the CME arrives.
Geomagnetic activity starting Quiet, becoming Active to Minor Storm with any CMEs arrival in the next few hours, before gradually easing Day 2. During Day 3 (20 Feb) geomagnetic activity is likely to become Active to Minor Storm with a Chance of Moderate Storms affecting Earth.

**Energetic Particles / Solar Radiation:** The count rate of energetic particles (high energy protons) is most likely to remain at background levels, but with a slight chance of exceeding the S1/Minor Storm level in response to larger flares.

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Met Office

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**Geomagnetic Storms:**

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | No | 40 | 20 | 60 | 20 |
| Strong | G3 | No | 1 | 1 | 10 | 1 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | Yes | 50 | 50 | 40 | 40 |
| Very Active | R3 to R5 X | Yes | 15 | 15 | 10 | 10 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | ≥ S1 | No | 15 | 10 | 5 | 5 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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